

Effects-Based Operations:

CHANGE IN THE NATURE OF WARFARE

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Aerospace Education Foundation

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Foreword

The Gulf War air campaign introduced profound changes in the planning and conduct of warfare. The results were dramatic in that they changed the expectations of modern warfare. Today and in the future, armed conflict is expected to be short, decisive, and accomplished with a minimum of casualties.

Much of the success achieved by the US and its allies in Desert Shield/Desert Storm is rightfully attributed to advances in technology—the combination of greater precision in weapons with the access enabled by stealth, along with more rapid dissemination of knowledge through information technologies. Over a decade has elapsed since the Desert Storm turning point in the conduct of conventional war. The security environment has changed and the tools of warfare have been improved, but what is yet to be fully understood and incorporated into our security planning is another critical element of what enabled success of the Gulf War air campaign: the effects-based approach to its planning and execution.

In this essay, Brigadier General Dave Deptula updates an earlier work, and explains the essence of effects-based operations. Describing how it was used as the basis of air campaign planning in the Gulf War, he goes on to suggest that the US security establishment incorporate effects-based operations as the foundation of its security strategy as we move into the future.

In presenting this paper, the Foundation hopes to expand the nation's discussion of these important security issues. General Deptula's paper has significant implications for how we fight in the future, how we will define success in warfare and—perhaps most important of all—the nature and type of forces that we must field to deal with emerging and future threats to our national security interests. It also has very significant implications for the mix of aerospace, land, and sea forces for the future.

Introduction

Well before dawn on January 17, 1991, Major Greg Biscone flew the first of two B-52s toward Wadi Al Kirr airfield—a recently completed forward fighter base in central Iraq. His targets were the taxiways between the runway and hardened aircraft shelters.

Skimming 300 feet over the desert at 500 miles per hour it was so dark the night vision goggles and low light TV system didn't help. Iraqi early warning radars forced Biscone to drop his huge, old bomber lower—the surface-to-air missile (SAM) threat was greater than the danger of flying within a wingspan of the ground. Minutes later, Biscone and his counterparts' "Buffs" executed a successful multi-axis attack crippling the airfield and leaving anti-aircraft artillery with nothing to fire at but the receding jet noise.¹

Less than an hour earlier, stealthy F-117s had struck the heart of the enemy—Baghdad—in the opening minutes of the war. Tomahawk land attack missiles (TLAMs) followed, striking critical electric systems and government decision-making and communications centers. F-15Es, part of an initial covert entry scheme into Iraq, attacked known Scud launch facilities that threatened Israel and Coalition nations. While Biscone and his flight were departing the target area in central Iraq, similar attacks occurred at four other forward fighter bases spread across Iraq. Simultaneously, 13 F-117s flew against 22 separate targets including command leadership bunkers north of Baghdad, communications exchanges in

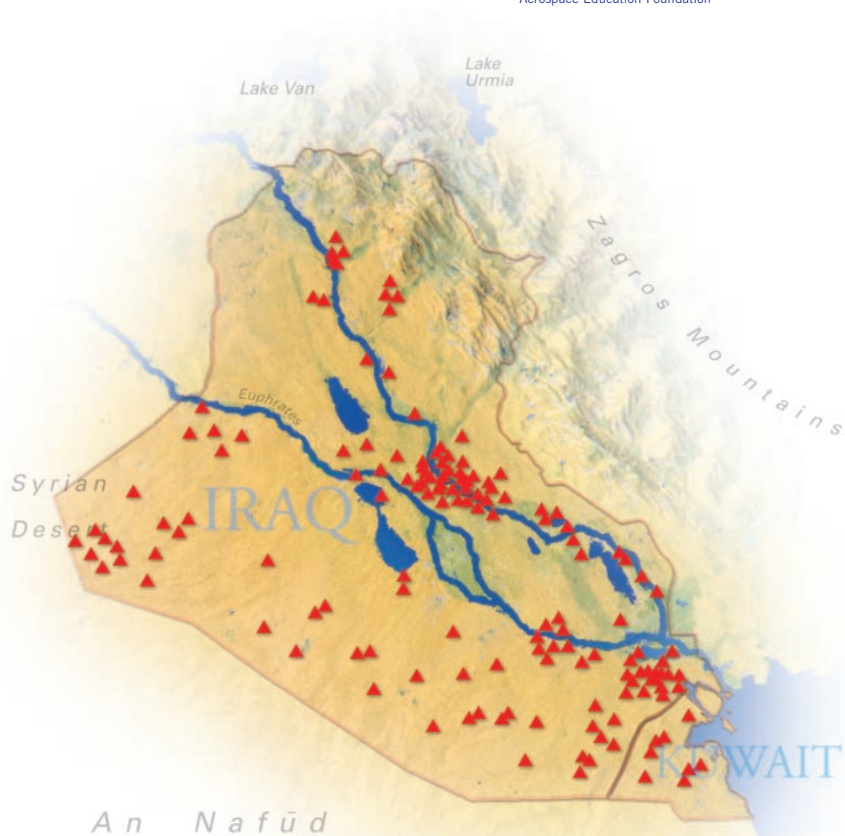


Figure 1
Target coverage first
24 hours of Gulf War.

It was not the number of sorties however, that made this first day of air attacks so important, but how they were planned to achieve specific effects.

Baghdad, interceptor operations centers in Kuwait, satellite downlink facilities, and vital communications nodes around the country. In western Iraq 30 aircraft attacked Saddam Hussein's chemical air attack facilities. Just north of Basrah, 38 fighters put Shaibah air field out of commission, and 44 others stripped away the medium altitude SAM defenses west of Baghdad near Al Taqqadum airfield, the Habanniyh oil

storage area, and three chemical weapons precursor facilities to clear the way for attacks the following afternoon.

Before the crews of Biscone's flight returned to Diego Garcia, Republican Guard headquarters in the Basrah area and regular Iraqi ground forces near the Saudi border came under air attack. All suspected biological weapons storage sites were targeted and critical oil storage facilities were hit.

The Gulf War began with more targets in one day's attack plan than the total number of targets hit by the entire Eighth Air Force in all of 1942 and 1943.

Conventional air launched cruise missiles (CALCMs) fired by B-52s flying from the United States reached electric facilities at Al Mawsil in Northern Iraq. By the end of the first 24 hours of the war, bombs also hit enemy bridges, military support and production factories, and naval facilities. In all, more than 1,300 offensive air sorties were flown that day.² It was not the number of sorties however, that made this first day of air attacks so important, but how they were planned to achieve specific effects.

The first night of the Gulf War air campaign demonstrated that the conduct of war had changed. One hundred fifty-two discrete targets—plus regular Iraqi Army forces and SAM sites—made up the master attack plan for the opening 24-hour period of the Gulf air war.³ The Gulf War began with more targets in one day's attack plan than the total number of targets hit by the entire Eighth Air Force in all of 1942 and 1943⁴—more separate target air attacks in 24 hours than ever before in the history of warfare.⁵

Defining Rapid Decisive Operations: Parallel Warfare

What was different about the concept of the air campaign in the Gulf War from previous air campaigns? What allowed planning against such a large number of targets in so short a time?

What allowed the Coalition to achieve its aims so quickly and with relatively little loss of life on both sides? What does this mean for the size, shape, and use of military forces in the future? This essay explores these key questions to illustrate the transformation of warfare demonstrated for the first time in the Gulf and how those changes anticipate the conduct of future warfare. Understanding the changes in the traditional application of force that occurred during the Gulf War should facilitate the exploitation of technology and development of warfighting concepts to better meet the defense challenges of the future.

The air campaign strategy capitalized on capabilities and highly adaptive attack plans designed to paralyze Saddam's control of forces, then went on to neutralize the enemy's capacity to fight, undermine its will to fight, reduce its military production base, and create the conditions to control its capacity to build weapons of mass destruction. This construct avoided Iraq's strengths on the ground—its vast defensive armies that had the potential to inflict high Coalition casualties.

The construct of warfare employed during the Gulf War air campaign has become known as *parallel warfare*,⁶ and was based upon achieving specific effects, not absolute destruction of target lists. The term “parallel” comes from basic

electrical circuit design. Anyone experiencing the frustration of Christmas lights on a series circuit versus a parallel circuit will recognize the analogy. In the series circuit depicted at the top of figure 2, when the switch closes, electrons flow from the battery to the five light bulbs illustrated.

However, electricity must pass through each light before the next is lit—sequential flow. In the parallel circuit at the bottom of figure 2, when the switch closes, electricity reaches all the lights virtually at the same time—simultaneous flow.

Applying the same concept to the application of force in war yields the terms serial (sequential) and parallel (simultaneous) warfare (see figure 3).

In air campaigns before the Gulf War, force was applied sequentially to “roll back” enemy defenses before attacking targets of the highest value. Area and point defenses had to be eliminated before war planners could gain access to what they really wanted to attack. In the upper portion of figure 3, “Series Warfare-Sequential

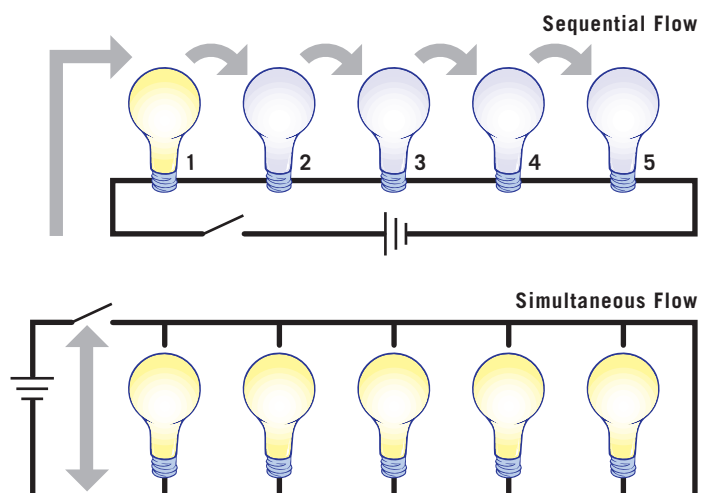


Figure 2
Basic electric circuits.

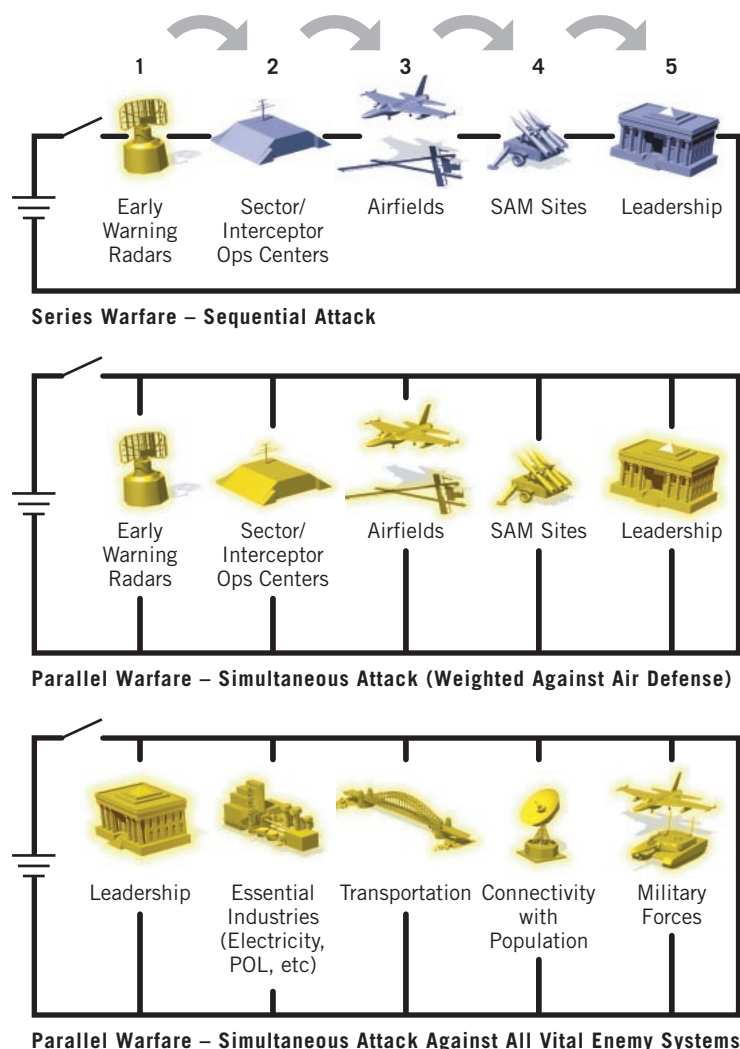


Figure 3
Series versus parallel warfare.

Attack,” the early warning sites, airfields, operations centers, anti-aircraft artillery, and SAM systems are targeted. Each target clears the way for the next one until finally the target of value, in this case leadership, can be hit. The huge effort required to suppress enemy air defenses and the time required to accomplish these tasks in sequence limit the feasibility of attacking several high value targets simultaneously.

Targets of highest value are generally those that are best protected by an adversary. It makes perfect sense to reduce enemy defenses before attacking these high value targets: reducing enemy defenses increases the probability of prosecuting a successful attack and reduces the likelihood of

heavy losses. The Eighth Air Force’s mission to Schweinfurt, Germany, on October 14, 1943—which sustained 20 percent losses—is a familiar and dramatic example of what happens when enemy defenses are fully functional and effective. High losses caused by Luftwaffe fighter defenses demonstrated the imperative for control of the air to reduce friendly losses and allow daylight “precision” bombing.

The middle section of figure 3 depicts simultaneous attack against the same set of targets. Hitting all elements of an air defense system simultaneously facilitates attacks on high value targets, but this still leads to a somewhat sequential application of force. The majority of targets are defenses en route to, and in the area of the target of value. This kind of partial simultaneous attack can be accomplished with large force packages of non-stealthy aircraft in discrete areas of a theater or on a one-time attack against a limited target set. However, the large force packages required to suppress enemy air defenses tends to limit the total number of areas struck in this manner. To hit an entire theater-wide set of high value targets requires many attacks in a similar fashion.

The capacity for a simultaneous attack on the entire array of high value objectives with little or no need to suppress enemy air defenses opens the door to monumental changes in the conduct of war—enables surprise at the tactical level, a larger span of influence, fewer casualties, paralyzing effects, and shorter time to impose effective control over the enemy. The lower portion of figure 3 depicts simultaneous attack against a wider array of high value targets than in the previous case. Leadership facilities, key essentials such as refined oil and electricity, transportation nets, connectivity between the leadership and the population, and fielded military forces are attacked at the same time.⁷ The capacity to have a controlling effect on the enemy’s ability to act as desired is clearly much higher in this case than in the previous examples.

Greater high value target coverage in a short time is not the only benefit of parallel attack.

When combined with a strategy to render an adversary ineffective in controlling its state/organization, essential industries, transportation infrastructure, population, or forces, the ramifications of parallel attack extend well beyond the arithmetic advantage of hitting more high value targets in a shorter time.

The successful prosecution of parallel war requires more than compressing sequential attacks into one simultaneous attack. Parallel war exploits three dimensions—time, space, and levels of war—to achieve rapid dominance. In the opening hours of the Gulf War, all three dimensions were exploited:

- Time—within the first 90 minutes over 50 separate targets were on the master attack plan. Within the first 24 hours, over 150 separate targets were designated for attack.⁸
- Space—the entire breadth and depth of Iraq was subjected to attack. No system critical to the enemy escaped targeting because of distance.
- Levels of war—national leadership facilities (strategic level), Iraqi air defense and Army operation centers (operational level), and Iraqi deployed fighting units—air, land, and sea (tactical level)—came under attack simultaneously.

Simultaneous application of force (time) across each level of war uninhibited by geography (space) describes the conduct of parallel warfare. However, the crucial principles defining parallel warfare are how time and space are exploited in terms of what effects are desired, and for what purpose, at each level of war—the essence of effects-based operations. The term rapid decisive operations (RDO) is a recent addition to the defense lexicon that can be used to capture the fundamental nature of the results achieved during the Gulf War. However, RDO seeks to achieve a similar result with greater rapidity and less mass. Accordingly, effects-based operations will be central to its success.

Historically, the principal way to get to enemy vulnerabilities—their centers of gravity—was through the destruction of defending forces.

Centuries of surface warfare created the common view that the intrinsic purpose of military force is the destruction of an enemy's military force. Adding to the weight of this legacy is misinterpretation of Clausewitz's monumental work, *On War*, as reducing warfare to the physical destruction of opposing forces in “decisive” battles.⁹ While not the “sound bite” Clausewitz might have liked his students to remember, it is the lesson many carry away.¹⁰

Well beyond the activity of destroying an opposing force lies the ultimate purpose of war—to compel a positive political outcome. The use of force to control rather than destroy an opponent's ability to act lends a different perspective to the most effective use of force. Control—the ability to dominate an adversary's influence on strategic events—does not necessarily mean the ability to manipulate individual tactical actions. For example, during the Gulf War Iraq was able

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to launch individual aircraft sorties; however, because Iraq's air defense system was rendered ineffective by Coalition operations, individual aircraft sorties flown were of negligible consequence.

Any political entity can be thought of as a system consisting of a number of subsystems, or to borrow a term coined in the former Air Force Systems Command—a system of systems.¹¹ The ability to affect essential systems on which an adversary relies to achieve influence is critical to this concept of control—as is the correct identification of which systems are “essential.” Using force to achieve specific effects against portions of a system that render the entire system ineffective

can yield effective control over that system. This notion introduces new terms to describe how the application of force can achieve effective control over an enemy, including; render ineffective, negate, disable, prevent, neutralize, limit, reduce, stop, etc. Force used to effectively control a system—to achieve specific effects rather than destroy it—may lead to the same strategically relevant result, yet with significantly less force.

Achieving effective control conserves forces that would otherwise be needed for destruction; this in turn expands the number of systems exposed to control through force application—a form of leverage. For example, shutting down the power grid that provides electricity to the air defense system around Baghdad requires much less force to negate the air defense system than destroying each element of that air defense system. Effective control of enough of the adversary's enabling operational level systems will paralyze his ability to function at the strategic level. At that stage, the enemy has no choice but acquiesce to the will of the controlling force or face ever increasing degrees of loss of control.

The significance of the capacity to affect a large number of objectives simultaneously in the Gulf War was not simply that a lot of targets could be attacked, but that vital enemy systems could be brought under effective control. This was made possible through attack of systems in parallel, and at rates high enough that Iraq could not repair, adapt to, or find alternatives to keep critical systems functioning at a level sufficient to continue resistance.

The object of parallel war is to achieve effective control over the set of systems relied on by an adversary for power and influence—leadership, population, essential industries, transportation and distribution, and forces.¹² Action to induce specific effects rather than simply destruction of the subsystems making up each of these strategic systems or “centers of gravity” is the foundation of the concepts of parallel war, rapid decisive operations, or any other concept that seeks to achieve rapid dominance over an adversary. The crux of these constructs is not their physical elements, but their conceptual ones. At the beginning of the twenty-first century the significance of the evolution of change in warfare lies in the way we think about it.

Seeking Rapid Dominance: Concept Origins

Simultaneous attack in any type of warfare has always been desirable.

Historically, it has been used to achieve surprise in an opening move of a longer lasting sequential series of campaigns or in campaigns and operations of short duration. Japanese attacks against Pearl Harbor and the Philippines within a matter of hours are an example of the former, while the 1967 Arab-Israeli War and the 1986 raid on Libya are examples of the latter.

There are three primary reasons simultaneous air attack never evolved to the degree of parallel war demonstrated in the Gulf War: 1) the requirement for mass to compensate for a lack of precise weapons delivery; 2) the high number of resources required to suppress increasingly effective enemy air defenses; and 3) the absence of an operational level concept focusing principally on effects to achieve control over an opponent rather than aggregate destruction to achieve military objectives. The first two required technological solutions—which were not mature before the mid-1980s—to sustain continuous attacks against the most vital enemy target systems. Those two technological solutions—namely stealth and precision—enabled the third, and perhaps most important, a concept of operations aiming to achieve control over an enemy's core systems.

The idea of targeting large systems to achieve debilitating effects is not new. It was a central tenet of the strategic air offensives against Germany and Japan during World War II. Early

Even when control of the air was wrested from the Luftwaffe in the spring of 1944 and Allied aircraft were free to roam the Axis skies, the level of “precision” bombing still required a thousand aircraft to succeed against one target.

in the twentieth century theorists described the vulnerability of “modern” nation states’ highly centralized, interdependent political and economic structures to air attack. Lord Montague in 1909 spoke of crippling an entire nation through air attacks on “nerve centers” like London. The targeting of, “government buildings, the Houses of Parliament, the central railway stations, the central telephone and telegraph offices, and the stock exchange”—all attacks against the nation’s central nervous system producing a “massive and fatal paralysis.”¹³ Similar theories were advanced by Italy’s Giulio Douhet, America’s Billy Mitchell, Britain’s Arthur Tedder, and others. Their ideas were summarized in an early statement of the United States Army Air Corps, “Disruption or paralysis of [vital] systems undermines both the enemy’s capability and will to fight. Proper selection of vital targets in the industrial, economic, and social structure of a modern industrial nation, and their subsequent destruction by air attack, can lead to fatal weakening of an industrial enemy nation...”¹⁴

Early work on identifying critical targets vulnerable to air attack was conducted by the Air Corps Tactical School (ACTS). Searching to formulate doctrine for an air offense against modern industrialized states, instructors there began a systematic evaluation of industrial, economic, and social development complexes in the United States. Air Corps Tactical School findings led to a “subtle but very significant variation from the doctrines of Douhet and Mitchell. The latter advocated destruction of factories and industrial centers and population centers. In contrast, the School favored destruction or paralysis of national organic systems on which many factories and numerous people depended...”¹⁵ They went on to identify electric power systems, transportation systems, railroads, fuel, food distribution, steel manufacturing, and other manufacturing industries vital to the operation of the economic, industrial, and war-making welfare of the state. Effects-based operations takes these ideas one step further, aiming not just to impede the means of the enemy to conduct war or the will of the people to continue war, but the very ability of the enemy to control its vital functions.

PRECISION ENABLES EFFECTS-BASED OPERATIONS

The difficulty in extracting the maximum potential from earlier theories of strategic attack was a shortcoming in execution. Even when con-

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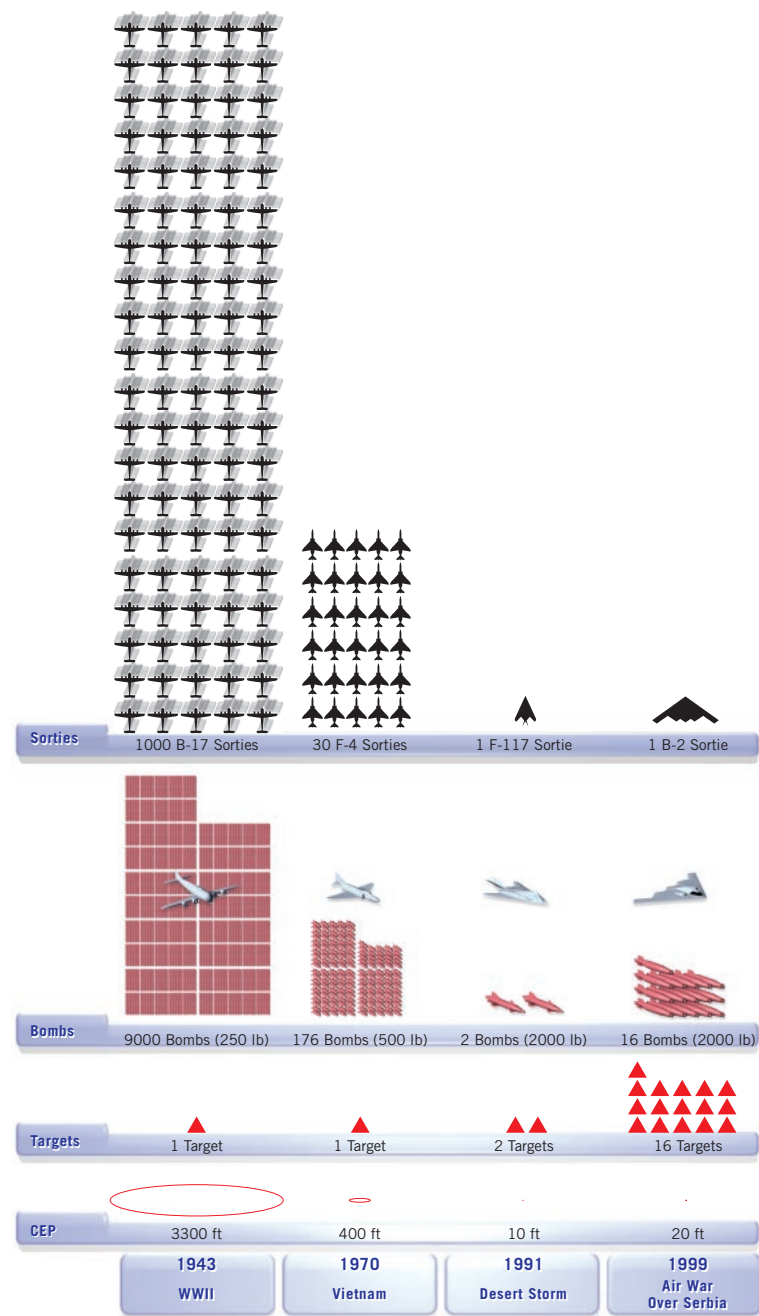


Figure 4
Precision redefines
the concept of mass.

trol of the air was wrested from the Luftwaffe in the spring of 1944 and Allied aircraft were free to roam the Axis skies, the level of “precision” bombing still required a thousand aircraft to succeed against one target. Only a very small percentage of bombs usually hit their targets. Over the entire war, only about 20 percent of the bombs aimed at targets designated for precision attack fell within 1,000 feet of their aimpoint.¹⁶ The large number of aircraft needed to achieve success made simul-

taneous attack technically impossible. Generally, target sets were attacked in sequence even after control of air was secured because large numbers of aircraft had to be massed repeatedly to debilitate just one target set.

The World War II campaigns against the German ball bearing and aircraft production industries took seven months—in part impeded by the lack of air superiority over Germany. Even with air superiority, however, the transportation campaign took five months, and the oil campaign took six months. These relatively long periods of focusing against one target gave the enemy time to recover in other target systems making it impossible to paralyze more than one target system at a time. Post-war analysis reflected that “...to knock out a single industry with the weapons available in 1943 and early 1944 was a formidable enterprise demanding continuous attacks to effect complete results.”¹⁷

In World War II, air commanders were “compelled to substitute sheer tonnage for precision...”¹⁸ However, World War II also witnessed the first combat use of precision guided munitions

(PGMs).¹⁹ The challenge of dropping bridges spurred the further development of PGMs, and the last year of the Vietnam War saw the first large-scale use of laser guided bombs (LGBs).²⁰ By the time of the Gulf War, PGMs overcame the necessity to mass aircraft for successful attack. During the Gulf War over 9000 LGBs were used out of a total of approximately 220,000 bombs.²¹ This seemingly small portion of the total number of weapons dropped understates the consequence of their effect. In some cases, a single aircraft and one PGM during the Gulf War achieved the same result as a 1000-plane raid with over 9000 bombs in World War II—and without the associated collateral damage.²² PGMs can offset the need for mass attacks to achieve a high probability of success—a reality evidenced with the dramatic increase of their use in the air war over Serbia, where nearly 7000 of the 16,500 munitions were PGMs, while the sorties required to deliver them decreased.²³

STEALTH: GAINING ACCESS AND LEVERAGING PRECISION

As aerial weapons delivery accuracy improved after World War II, so did air defenses. By the early 1970s radar detection and radar-guided surface guns and missiles had become highly lethal to attacking aircraft. Experience in the Vietnam war and the 1973 Arab-Israeli war indicated that highly defended targets would yield to successful attack only with large “force packages” of aircraft. Designed to get strike aircraft into and out of a target area, each force package contained—besides

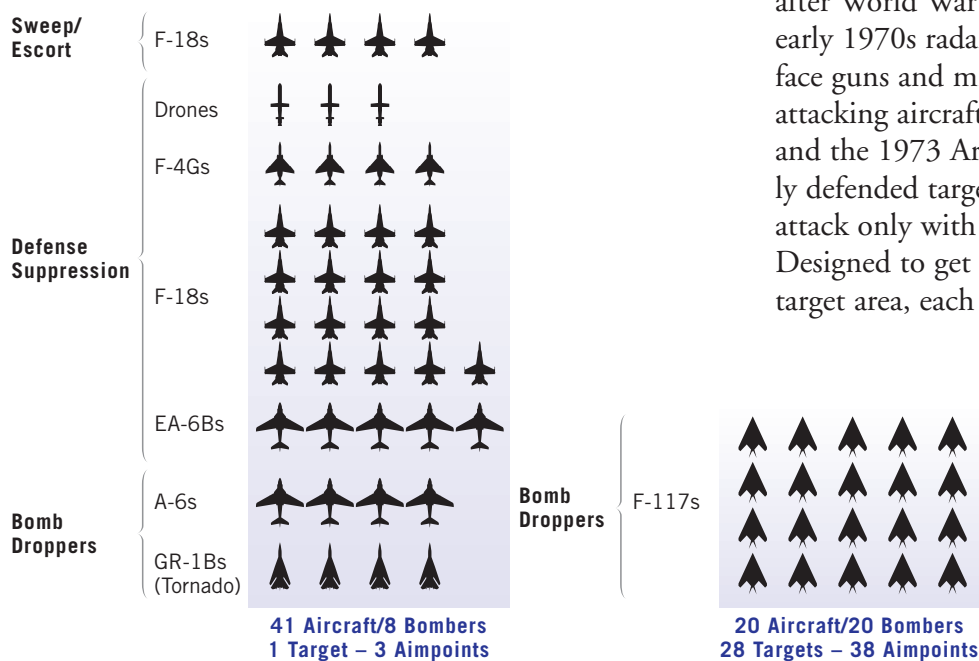


Figure 5
The leverage of stealth: Non-stealth versus stealth attack during the opening hours of the air war.

the bomb dropping aircraft—aircraft to suppress enemy early warning and surface-to-air missile radars, others to destroy or jam enemy defensive missile systems, and still others to defend against enemy aircraft attacks. A typical force package during the Linebacker I campaign in Vietnam consisted of 62 combat aircraft (not including air refueling support) to get 16 fighter-bombers into and out of the target area.²⁴ Even though weapons delivery had become more precise by the early 1970s, the high number of support, force protection, and defense suppression aircraft needed to successfully attack a target constrained the number of targets that could be attacked at any one time.

Delaying enemy radar detection until too late for reaction reduces the effectiveness of any air defense system. Techniques to reduce radar cross section—a measure of the ability of a radar to “see” a signal return from a radar reflective target—saw early application on reconnaissance aircraft and drones in the late 1950s and 1960s. By late 1978, the Lockheed F-117 was being developed, and it became operational in October 1983. The last of 59 F-117s was delivered in July 1990.²⁵ The next month some of them deployed to Saudi Arabia.

The combination of stealth and precision radically reduces the number of aircraft, supporting personnel, and infrastructure required to effectively strike a large number of targets. The significance of the stealth and precision combination was first captured in October 1990 in a relationship calculated from the version of the air cam-

During the entire war, F-117 stealth aircraft flew less than 2 percent of the total combat sorties, while attacking 43 percent of the targets on the master target list.

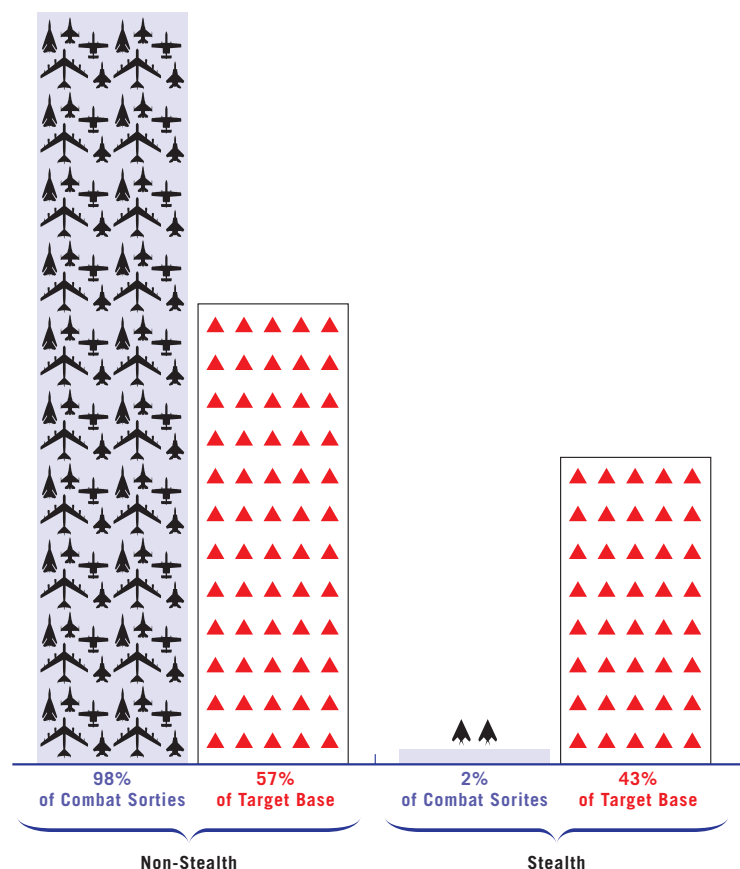


Figure 6
Stealth aircraft flew less than 2 percent of the combat sorties but hit over 40 percent of the strategic target base during the Gulf War.

paign master attack plan existing at the time: “The planning effectiveness of the F-117 (stealth) is illustrated by the fact that it accounts for only 5% of the combat aircraft (30/580) yet it strikes 44% of the first 24 hour targets.”²⁶ During the entire war, the F-117 stealth aircraft flew less than 2 percent of the total combat sorties, while attacking 43 percent of the targets on the master target list.²⁷

A comparison of the first non-stealth aircraft attack in the Basrah area with a wave of F-117 strikes at the same time illustrates the enormous leverage of the stealth/precision combination. The non-stealth force package consisted of 41 aircraft attacking one target with three aimpoints. The force package consisted of: four A-6s and four Tornados dropping bombs on the target; four F-4Gs providing suppression for a particular type of SAM; five EA-6Bs jamming Iraqi early warning and acquisition radars; 17 F/A-18 fighters carrying radar-homing missiles to suppress SAMs, four

other F/A-18s providing air-to-air protection, and three drones to excite the air defenses—41 aircraft, so eight could drop bombs on three aimpoints. At the same time, 20 stealth aircraft (F-117s) were targeted against 37 aimpoints in other areas with an equal and even higher threat intensity—a 1,200 percent increase in target coverage using fewer than half the number of aircraft.²⁸

EFFECTS VICE DESTRUCTION: THE KEY TO RAPID DECISIVE OPERATIONS

Targeting manuals include words about targeting to achieve effects, but pages and chapters are written about damage expectancy, provability of damage, and weaponeering to achieve levels of destruction. This focus on destruction results from two traditional concepts of war—annihilate an enemy through outright destruction, or exhaust an enemy before he exhausts you (attrition).²⁹

An alternative concept of warfare is based on control—the idea that an enemy organization's ability to operate as desired is ultimately more important than destruction of the forces it relies on for defense. In terms of securing favorable conflict termination, rendering the enemy force useless is just as effective as *eliminating* that enemy force. Further-more, controlling an adversary can be accomplished quicker, and with far fewer casualties. In words attributed to Sun Tzu: “Those skilled in war subdue the enemy's army without battle. They capture his cities without assaulting them and over-throw his state without protracted operations.”³⁰ Centuries later, B.H. Liddell Hart expanded on this idea adding, “While such bloodless victories have been exceptional, *their rarity enhances rather than detracts from their value*—as an indication of latent potentialities, in strategy and grand strategy.”³¹ To be sure, neither strategist suggests reliance on achieving victory without bloody engagements. Instead, they advocate seeking alternative means to achieve victory—those that may, with favorable settings, do so more

swiftly, and at less cost. Simply put, rather than the operative means to inhibit enemy activity, destruction should be viewed as one means to achieve control over an enemy. In this approach, destruction is used to achieve effects on each of the systems the enemy organization relies on to conduct operations or exert influence—not to destroy the systems, but to prevent them from being used as the adversary desires. Effective control over adversary systems facilitates achieving the political objectives that warrant the use of force.

Generally, conventional planners and intelligence personnel tend to think about targeting in terms of “the required number of sorties to achieve the desired damage against each target.”³² The bread and butter of a targeting officer involves “determining the quantity of a specific weapon required to achieve a specified level of damage to a given target.”³³ An intelligence evaluation of the effectiveness of the air campaign during the Gulf War demonstrates how focus on individual target damage rather than the effects of attacks on the system under attack can be misleading.

On February 15, 1991 the Iraq target-planning cell received a report on the progress of the air campaign in accomplishing its target set objectives. Because all the targets in the primary and secondary electric target set were not destroyed or damaged to a specific percentage, the analysis concluded the objective had not been met.³⁴ In actuality, the electric system was not operating in Baghdad, and the power grid in the rest of the country was not much better off. The effect desired in attacking this system was not destruction of each of the electric sites, it was to temporarily stop the production of electricity in certain areas of Iraq. The planning cell knew the operating status of the Iraqi electric grid and had already reduced strikes against electric sites to maintenance levels.³⁵ The determinant of whether to plan a strike on an individual site was whether the electric system was operating in the area of interest, not the level of damage or lack thereof to an individual site.

During the war some Iraqi power plant managers shut down their electric plants to avoid targeting thereby creating our desired effect without exposing Coalition members to danger, and freeing up air resources for another task—Sun Tzu’s dictum fulfilled.

During the war some Iraqi power plant managers shut down their electric plants to avoid targeting thereby creating our desired effect without exposing Coalition members to danger, and freeing up air resources for another task—Sun Tzu’s dictum fulfilled.

While the virtues of planning to achieve systemic effects were discussed early in the conceptual phase of the air campaign planning effort, initial attack planning was done on the basis of traditional destruction-based methodology. For example, early in the process, intelligence identified two major sector operations centers (SOCs) providing command and control of Iraqi air defenses—one in Baghdad and one at Tallil air base in southern Iraq.³⁶ Each was hardened to protect two underground command and control bunkers. Weapons experts and target planners determined it would take eight F-117s with a mix of Guided Bomb Units (GBU)-27 and GBU-10 2,000-pound bombs to destroy the bunkers at each SOC. Since only 16 F-117s were available for planning at the time, destroying the two SOC’s meant using all the available F-117s—an 8:1 aircraft-to target-ratio.

Intensive planning for the offensive air campaign began in-theater on August 21, 1990. By

August 30, the known targets in the strategic air defense system expanded almost tenfold. Further intelligence analysis of the Iraqi air defense network found not just two SOC’s in Iraq, but four, and associated with each of these SOC’s were three to five interceptor operations centers (IOC’s), and associated with the IOC’s were a number of radar reporting posts. The new information significantly increased the challenge of attaining the operational objective to “render Iraq defenseless and minimize the threat to allied forces.”³⁷ For the initial attack plan, the effect desired was to shut down the air defense command and control system in certain areas enabling non-stealthy aircraft to approach their targets without resistance. However, there were not enough stealthy F-117s to destroy each of the newly discovered nodes of the air defense system simultaneously.

The solution lay in effects-based rather than destruction-based targeting. Postulating that a 2,000-pound bomb could go off in the other end of the building in which the US air campaign planners were working, one of the planners made a case that while the planning group might survive, if so they would abandon the facility to seek shelter. The point was that the SOC’s and IOC’s did not require destruction. Targeting only had to render them ineffective, unable to conduct operations through the period of the ensuing attacks by non-stealthy aircraft.

By September 6, the attack plan was rewritten putting no more than two F-117 loads on any particular SOC.³⁸ This greatly multiplied the number of stealth/precision strikes for use against other targets—IOC’s, biological, and chemical weapons storage facilities, and other critical targets. Consequently, the opening 24 hours of the air war found 42 F-117 sorties flying 76 target attacks—almost a 1:2 aircraft-to-target ratio.³⁹ This constituted just over 2 1/2 times the stealth strike sorties (from the original plan’s 16), yet stealth platforms were now attacking 38 times the target base.⁴⁰

The process of planning for effects is complex. In conjunction with intelligence, planners must determine which effects on each enemy system

can best contribute to the fulfillment of military and political objectives of the theater campaign. This depends upon the specific political and military objective, enemy vulnerabilities, the target systems themselves, and weapon systems capabilities. Since a campaign plan is highly dependent on the weapon systems available, an effective plan must extract maximum impact from those systems—not in terms of absolute destruction of a list of targets, but in terms of effects desired upon target systems.

CONCEPT OF OPERATIONS

Strategy is the orchestration of means to accomplish ends. The process of selecting air assets (means), and assigning them against target systems to achieve specific effects (ends) is the air strategy underpinning an air campaign. It is generally articulated in a concept of operations (CONOPS) describing friendly force intentions and the integration of operations to accomplish the commander's objectives. Of concern here is not so much the process or format of a CONOPS, but rather the philosophy underlying the air strategy.

The command and control organization developed for planning and executing of air-to-surface attack in the Vietnam war, the Tactical Air Control System (TACS), focused to a large degree on allocating sorties to individual targets in support of ground operations. To a large extent, ground commanders selected and prioritized targets for the majority of operations processed by the central element of the TACS, the Tactical Air Control Center (TACC).⁴¹ Effectiveness in air-to-surface operations was measured in terms of responsiveness and efficiency in destroying individual tactical level targets. The focus of battle damage assessment was on the destruction of individual targets. The function and organization of the TACS led many to confuse the efficiency of hitting individual targets with the effectiveness of achieving campaign objectives.⁴²

The TACS was established in doctrine as the air command and control system for conventional war.⁴³ Improvements to the TACS between

The architects of the air campaign did not limit themselves to the “servicing a target list” approach.

Vietnam and the Gulf War focused on expediting responsiveness, enhancing sortie production rates, and incorporating modern systems to quickly process large air tasking orders (ATOs). Emphasis was on improving process—little effort or time was spent on development of air strategy or providing tools for the planning of air strategy. The “marriage” between Tactical Air Command (TAC) and the Army's Training and Doctrine Command (TRADOC) in the 1980s elevated the Army's doctrine of AirLand Battle as TAC's de facto air strategy in regional conflicts.⁴⁴ Basic Air Force instructional documents on target planning had a complete chapter on AirLand Battle targeting, but no mention of principles or guidelines for conventional strategic attack.⁴⁵ The Air Force's largest and most influential conventional air command, TAC, entered the 1990s with its vision of conventional war focused on supporting the Army—critically important, but only one element of its versatile potential.⁴⁶

Since the established planning process for conventional theater air warfare did not have any process beyond support of land forces on the battlefield, the principal focus of most Central Command Air Force (CENTAF) TACC planners and intelligence personnel in Riyadh in the late summer of 1990 was on tactical operations. With dedication and a sincere commitment to applying airpower in the best way they knew how, TACC personnel were nevertheless products of their past. The established procedures for the design of an ATO led them to a conventional force planning focus based on a mechanistic application of sorties against a list of individual targets in a sequential fashion. The process was often referred to as “servicing a target list.”

The offensive air campaign employed against

Iraq in early 1991 came together between August 1990 and January 1991. On August 8, 1990, the commander-in-chief, US Central Command (CINCCENTCOM) asked the Vice Chief of Staff of the Air Force to put together an air option for potential use against Iraq. The effort resulted in Instant Thunder—an initial concept of operations, a draft operations plan (OPLAN), and an initial cut at a first 24-hour attack plan. Embracing the concept on August 17, the CINC directed the key planners to deliver the concept to his joint force air component commander (JFACC) who was also acting as CINC forward in Riyadh, Saudi Arabia. While uncomfortable with the completeness of Instant Thunder, and feeling it lacked attention to defensive measures to counter further Iraqi aggression, the JFACC did ask some of the Washington based planners to remain in theater to form the nucleus of an offensive planning organization.⁴⁷ It was known simply as the special planning group (later as the “Black Hole” because of its highly classified status requiring special access clearance).

The design of the air campaign grew out of a mindset questioning how to impose force against enemy systems to achieve specific effects that would contribute directly to the military and political objectives of the Coalition.

The architects of the air campaign did not limit themselves to the “servicing a target list” approach. The design of the air campaign grew out of a mindset questioning how to impose force against enemy systems to achieve specific effects that would contribute directly to the military and political objectives of the Coalition. Planning was based on a center of gravity approach. It began

with a critical examination of potential strategic centers of gravity, their constituent operational systems (operational centers of gravity), and led to identifying the set of individual targets making up each system (tactical centers of gravity).

Assessment of whether to continue or stop attacks against a particular system’s target set was dependent on achieving the effects desired on the system. Individual targets only became important if the system was still operating. If the effects desired were achieved, it did not matter that individual targets may not have been hit. Returning to the electrical example, it did not matter to the air campaign planners that several individual targets remained undamaged—the electrical system was not operating.

Figure 7 illustrates the subtle, but significant difference between the destruction-based and effects-based approaches to warfighting. The upper half of figure 7 shows two methods of the serial targeting approach—a single prioritized list, and multiple target set lists prioritized in sequence. The serial approach targets those elements of an adversary’s defenses that restrict access to targets of critical value. For example, early warning radars, air defense systems, command and control nodes, and airfields are hit before production, government, and leadership facilities. This series methodology can be applied against an adversary’s entire target base, or against a group of individual targets. This is not unlike the approach taken in World War II. However, attacking one target system at a time allows the others to continue operation or recover from previous attacks.

The parallel attack scheme is shown in the lower half of figure 7. The ideal application of force in a parallel attack strategy to achieve rapid dominance involves the application of force against all targets in each target system at one time. With correct identification of target systems and appropriate targets critical to each system, if each target is hit, the effects desired within each system will likely occur. The simultaneous application of force in such a manner would enable friendly control over the adversary systems. In reality, however, the number of aimpoints to con-

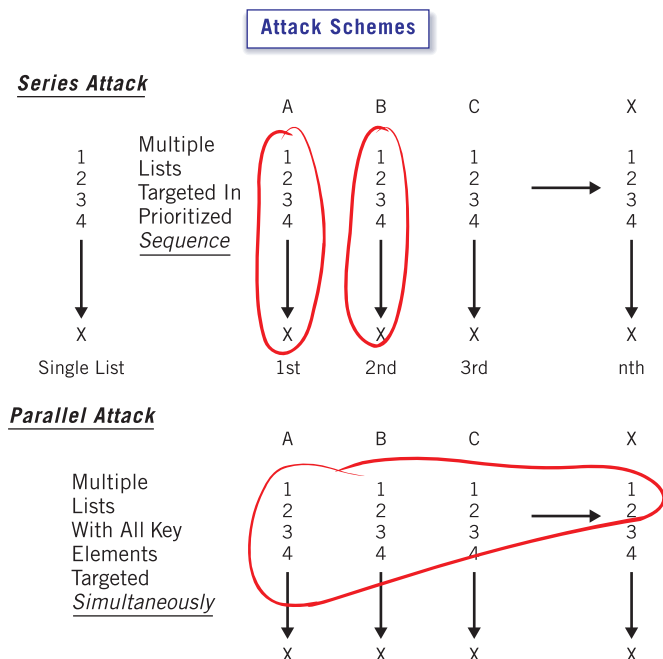


Figure 7
Air campaign attack schemes
(parallel versus serial).

duct such a campaign will generally exceed the conventional resources available. The difference between the total number of aimpoints and the number of assets required to hit each will influence campaign duration.

If all the aimpoints in the target set cannot be hit in one attack, then those with the most significant impact in each set should be hit first. Counter-air operations, for the same reasons as in the past, become a primary consideration when the attack force is not fully stealthy. Early attack operations are weighted to paralyze the air defense areas in which non-stealthy assets would operate.

An attractive element of parallel war is its potential to reduce the duration of conflict relative to previous wars.

This is the reason for the skewing depicted in the lower half of figure 7 toward the target sets A, B, C, etc., notionally representing air defense, air-field, and the command and control target sets. The weight of strikes against other target systems can increase with the attainment of air superiority, and continue until desired effects are obtained.

What figure 7 does not show, and what must be understood about the theoretical application of force is that intelligence is never complete about an enemy. No intelligence system will ever fully comprehend adversary strategic centers of gravity, the constituent operational systems, and the set of individual targets making up each system.

Moreover, an enemy will attempt to negate the effects of actions taken against them while trying to respond effectively. As a consequence, parallel war conducted to achieve rapid decisive operations may involve more than one set of force application, even if the resources are available to attack all the known elements of all the identified systems that might affect the enemy. Any enemy may react to attack in ways not anticipated, may have elements unknown to the friendlies, or the friendlies may not possess the capacity to quickly and effectively counter an enemy move. Any or all of these contingencies may change the calculus of the original parallel attack formula requiring additional application of force and lengthening the time to achieve desired effects.

Mobile Scuds, bad weather, untimely BDA, incomplete intelligence, and a variety of other frictions extended the duration of the Gulf War air campaign.⁴⁸ An attractive element of parallel war is its potential to reduce the duration of conflict relative to previous wars. However, the reality that knowledge of all elements affecting the conduct of war in each situation is always incomplete means the application of force to achieve war winning effects will take a finite, but indeterminate time. Duration of parallel war is determined by how well its dynamic elements are understood and how effectively the functioning systems of an adversary can be paralyzed.

In 1990, the confluence of stealth, precision, and an effects-based operational plan allowed the

planning and implementation of an air strategy based upon simultaneous attack against the entire array of target sets in a sustained air campaign. Stealth obviated the need for large numbers of suppression and force protection assets to strike a heavily defended individual target—air superiority

to a degree is inherent in the nature of stealth itself. Precision reduced the number of assets required to achieve a specific effect against an individual target. A focus on systemic effects rather than individual target destruction leveraged assets for strikes against other targets.

Effects-Based Operations: Why Is It Important?

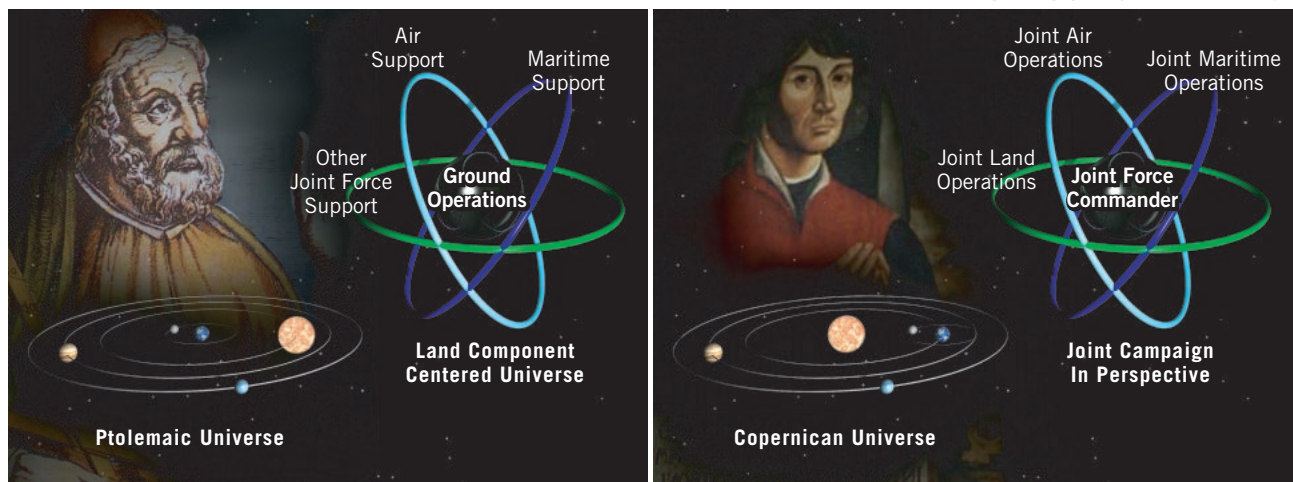
Parallel warfare is a manifestation of the “revolution in military affairs,” and effects-based operations is a critical enabler. More than a methodology for applying new technology,

effects-based operations calls for a basic realignment in war planning.⁴⁹ The character of warfare is changing and the degree of that change is considerable—analogous to the difference in world views between Ptolemy and Copernicus. Ptolemy reasoned that the universe revolved around the earth—not unlike the way some think about ground operations being at the center of all warfare. Copernicus set science straight, recognizing that the earth was but one part of a much greater universe, which revolved around the sun—not unlike the actual relationship between air, land, and sea operations and how they contribute to a joint theater campaign.

Adherence to legacy concepts of operation despite the illumination of new ideas is needlessly and dangerously stagnant.

The lesson this planetary metaphor offers to strategists is manifest. Though not necessarily as black-and-white as the order of the universe, adherence to legacy concepts of operation despite the illumination of new ideas is needlessly and dangerously stagnant. Accordingly, it is imprudent to ignore the implications and potential advantages of effects-based operations. The implications of effects-based operations include: First, effects-based operations offer a viable alternative to attrition and annihilation as the means to compel an adversary's behavior. Second, effects-based operations exploit current weapon systems while transitioning to emerging technology. Third, to best exploit the potential of effects-based operations, the military must institute organizational changes.

*Figure 8
Ptolemaic and Copernican views of the universe and analogies to common warfighting perspectives today.*



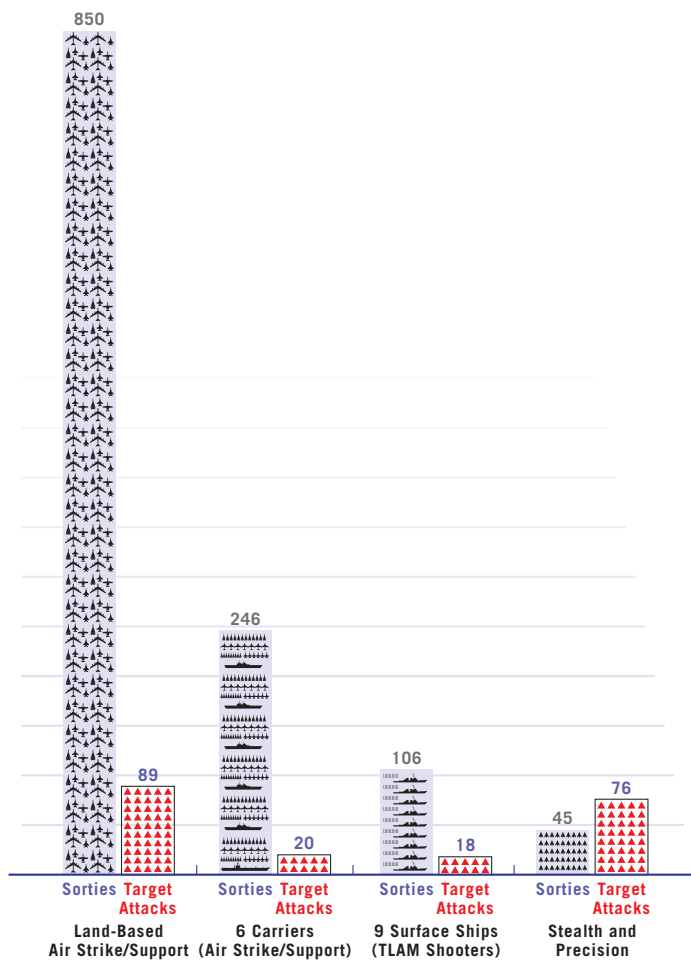


Figure 9
Target coverage: First 24
hours of the Gulf War.⁵¹

Effects-based Operations Demand Changes To Force Employment Concepts

War colleges teach two principal forms of warfare—attrition and annihilation. The Gulf War demonstrated another—control, through the application of parallel war. The strategies of annihilation and attrition rely on sequential, individual target destruction as the ultimate method of success and measure of progress—generally measured in terms of forces applied, or input. Using effects-based operations, the determinant of success is effective control of systems that the enemy relies upon to exert influence—output. Changing the way we think about the application of force may produce more effective use of force.

The combination of stealth and precision redefines the concept of mass. Mass, in the sense

Surface forces will always be an essential part of the military, but massing surface forces to overwhelm an enemy is no longer an absolute prerequisite to impose control over the enemy.

of an agglomeration of a large number of forces, is no longer required to achieve a devastating effect upon a system of forces, infrastructure, government, or industry. No longer do large numbers of surface forces require movement, positioning, and extensive preparation before we can achieve dominant effects over an enemy.⁵⁰

Surface forces will always be an essential part of the military, but massing surface forces to overwhelm an enemy is no longer an absolute prerequisite to impose control over the enemy. As an illustration, it requires more aircraft to transport a light infantry division than to move the total number of PGMs delivered during the Gulf War.⁵² Moreover, despite surface force “transformation” efforts, the tremendous demand for airlift continues. For example, though significantly lighter, the airlift requirements of the developing “Interim Brigade Combat Team” (IBCT) far exceed available inventory capability (given the objective time to deploy).⁵³ What moves into a theater—and when—should be determined by its ability to effectively influence an adversary. If the measure of merit for Service transformations became one of *desired effect per unit of lift*—the degree that combat effectiveness increases for each quantity of lift requirement—future lift requirements might actually be reduced to achieve military effects desired. Furthermore, massed friendly forces—air, ground, or sea—present a lucrative and vulnerable target to an enemy attack. Therefore, the traditionally accepted concept of “mass,” a valued principle of war, in some situations becomes a vulner-

**A Libyan-Style Raid: 120 Tons of Ordnance
4500 Miles from CONUS**

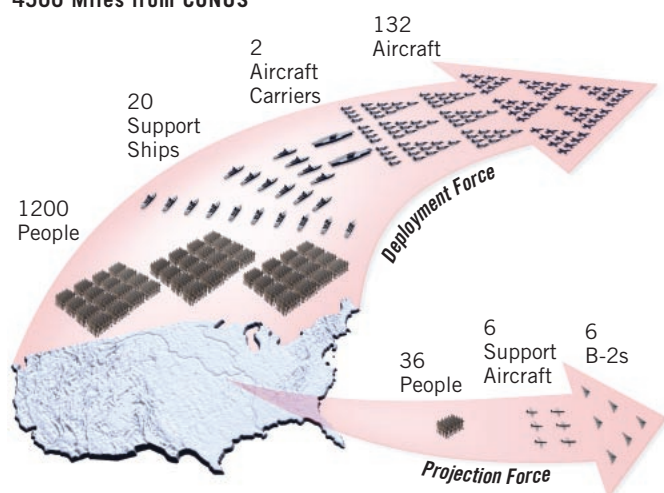


Figure 10
Projection of force versus
deployment of force.

ability. Potential adversaries may capitalize on the massing of forces and associated build-up time required by US legacy CONOPS for conducting major theater war (MTW) to deny US access. These anti-access strategies become more probable as delivery systems such as accurate ballistic missiles, cruise missiles, and weapons of mass destruction proliferate among potentially hostile states.

Since the ability to impose effects is independent of the massing of forces, the projection of force may become more important than the deployment of force. The object of presence or massing of force in a region is influence. The operative element of achieving influence is the threat or actual use of force to achieve a particular effect. If the same effect can be imposed without the physical presence or large scale massing of forces, then in some circumstances the deployment of forces can be replaced by the projection of forces to achieve the same effect. A Libyan-style raid is one example of a situation for which we now have a capability to apply the projection concept.

A recipient of a PGM does not know or care if the weapon came from near or far, or from what kind of platform, or from what kind of base.

Potential adversaries may capitalize on the massing of forces and associated build-up time required by US legacy CONOPS for conducting major theater war (MTW) to deny US access.

For military, political, and economic reasons the capability to project force to achieve influence has immense advantages compared to deploying force for the same purpose.

The evolving security environment requires: greater responsiveness—the ability to act in hours rather than weeks or months; long range—the ability to span the globe without forward basing; effective punch—the ability to deliver weapons with precision to achieve desired effects; and high leverage—the ability to reduce personnel, support, and overall dollar cost. Paul Nitze, a former Secretary of the Navy, notes: “We cannot depend on getting conventional ground forces into a hot spot quickly enough to deter further aggression, or should deterrence fail, to prevent an early fait accompli by an invader. Long-range bombers...can provide firepower with speed and reach, and demonstrate seriousness of intent in a way that missiles or carrier battle groups cannot.”⁵⁴ Focusing on influence (the end of strategy) rather than solely on presence (one traditional means to achieve it), enables us to consider different and perhaps more effective ways to accomplish the same goal with fewer resources.

Systems-based intelligence analysis is critical to the application of effects-based operations. Without adequate information about what an adversary relies upon to exert influence and conduct operations, parallel war cannot be effective. Exploiting advances in space-based systems,

communications technology, and rapid information transfer can reduce this potential vulnerability by reducing the need for forward-based organizational elements. Intelligence during the Gulf War is a good example of the rudimentary use of these capabilities. Much of the intelligence used in planning and execution of the Gulf War air campaign came from outside the theater—today, what we call “reachback.”

Changing the manner in which we think about the application of force requires changing the way we structure to employ it.

Redefining the concept of mass, increasing reliance on force projection rather than solely on force deployment, and aiming to control adversary systems rather than destroy them requires changes in the current approach to force management. The changes needed may include more reliance upon extra-theater command, control, communications, computer, and intelligence (C4I) organizations, distributive intelligence architecture, and “off-board” systems that can provide information direct to the user. These structural changes can reduce reaction time for effective use of intelligence, reduce the requirement for forward basing, and enable effective force application without having to deploy large command and support elements. Each of these changes moves vulnerable control nodes away from the enemy, and are critical to countering enemy anti-access strategies. Changing the manner in which we think about the application of force requires changing the way we structure to employ it.

Effects-Based Operations Has Increasing Relevance

We are in a transition phase of the ongoing revolution in military affairs. Parallel war achieved through effects-based operations departs from traditional strategies, but we fight with

the tools available today. We must carefully manage the transition to the new instruments of war to assure their development is not restricted by the theories of the past, and to adapt current systems to more lucrative strategies. It is proving to be a difficult transition. The tendency to retain orthodox concepts and doctrine is strong when the means upon which those concepts and doctrine were built still make up the preponderance of weapons. While military doctrine is invaluable in establishing a basis for application of force, it must not be allowed to constrain application of force in ways that might prove effective, but different from traditional modes. Effects-based operations provides a useful construct on how to conduct war that can bridge the gap between the weapons of today and the weapons of the future. It allows useful application of current weapon systems as we acquire a new generation of tools needed to fully exploit the concept.

After the major drawdown of forces at the end of the twentieth century, it remains imperative that new weapon systems and those retained from force cuts meet the demands of the evolving security environment while giving us the most capability for the dollar. However, “the widely held assumption about post-Cold War force levels has been that we can make do with less of the same; the same weapons and technology, but in radically

We must expand our thinking and disengage ourselves from stale notions of warfighting to seize the opportunities at hand.

reduced numbers.”⁵⁵ The results of the 1993 DOD “Bottom Up Review,” the 1995 Commission on Roles and Missions (CORM), and the 1997 Quadrennial Defense Review (QDR), tend to confirm this observation, which is no surprise since the weapons systems for the near term exist today. The apparent significance of the new elements that enabled the military success in the Gulf and, more recently, the air war over Serbia—the impact of revolutionary technologies such as stealth along with the evolving state of precision and new concepts for the employment of those systems—may be diminishing as the footprints of these successes recede and are covered by the sands of inertia of past warfighting paradigms.⁵⁶ Current weapons were built for strategies of the past. We must guard against reverting to the better known past, allowing inertia to distort strategies of the future, or allowing a previous “monopoly” of a mission area to inhibit more effective application of new technologies or operational concepts. Put positively, we must expand our thinking and disengage ourselves from stale notions of warfighting to seize the opportunities at hand.

The air campaign in the Gulf and over Serbia used bombs and missiles on individual targets to achieve a specific effect within the parent system.

These air campaigns gave us a view of the leverage that stealth, precision, rapid and secure information transfer, ready access to accurate positional information, and other cutting edge technological systems can provide. However, while the aircraft/PGM match of the 1990s was orders of magnitude beyond the systems used during World War II, it is crude compared to the ideal means for the conduct of effects-based operations. We must continue to explore follow-on systems that will provide even higher leverage effects. As technological innovation accelerates, “non-lethal” weapons and cyberwar enabled by information operations, will become operative means in parallel war.

The ability to achieve effects directly against systems without attacking their individual components would allow a preferable application of the concept of parallel war than we are capable of today. Indeed, the ultimate application of parallel war would involve few destructive weapons at all—effects are its objective, not destruction. Non-lethal weapons, information warfare, miniaturized highly accurate munitions, and space-based systems have the potential to approach that theoretical goal. They are the next steps in the evolution of tools for the conduct of parallel war.

The Military Must Embrace Organizational Change To Exploit Effects-Based Operations

The end of the Cold War and the dramatic reduction in military forces of the United States have accelerated the need for effects-based military strategy.

We can no longer afford duplicative

systems, but more pertinently, we may no longer have the option of overwhelming force or an abundance of weapon systems to conduct war in the future. Today, the permanence of the philosophies of attrition and annihilation tend to inhibit the development of organizations and doctrine that capitalize on effects-based operations that enable parallel war.

The Coalition was fortunate to have an overwhelming number of air forces in the Gulf War. When elements of one force component chose to bypass the joint air planning process, the JFACC, in the interest of avoiding doctrinal strife, could afford to rely upon forces directly under his command to accomplish theater objectives.⁵⁷ In the future, the luxury of each Service component doing its own thing may not be an option. Decisions on the use of force must be made on the basis of how they can have the most effect in accomplishing the joint force commander's theater objectives.

Jointness is the use of the most effective force for a given situation.

Only new organizations and doctrine aiming to exploit effects-based operations can fulfill the full potential of this concept.

While non-lethal weapons and information warfare will allow us to further capitalize on the concept of targeting for effects while continuing to limit casualties, only new organizations and doctrine aiming to exploit effects-based operations can fulfill the full potential of this concept. Non-lethal weapons and information warfare should enhance the ability of our forces to conduct operations to directly achieve desired effects. In this respect, recent attempts to develop and write joint military doctrine are helpful when their focus is on weapon systems capabilities and effects-based planning rather than employment environment or presumptions of attrition and annihilation.

The Gulf War was a joint endeavor, as were US military operations in Haiti, Bosnia-Herzegovina and Kosovo. It is important to recognize that the meaning of "jointness" is not the equal or obligatory use of each Service in every contingency or war. Jointness is the use of the most effective force for a given situation. Too often "jointness" is interpreted as a "federated" rather than "integrated" or "unified" application of Service components. To paraphrase former President George Bush, jointness is the "use of the right force, at the right place, at the right time," and one could add, for the right purpose.⁵⁸

In its development of the rapid decisive operations construct, Joint Forces Command would be wise to heed this definition, lest it fall prey to the “little league rules” interpretation of “jointness” where everyone on the team plays in every game. This construct can only lead to waste, ineffectiveness, and inefficiency in a quest for the wrong kind of “jointness.” Rather, jointness is a means for ensuring success—not an end unto itself. Parallel war through effects-based operations does not exclude any force component in time, space, or level of war at the outset of any political-military challenge. However, that does not equate to each force always participating in every operation or to a degree in some proportion to their size or presence. Whoever can perform the operations to achieve the desired effects best at the time should have it assigned to them.

An example of capability-based weapons allocation was the incorporation of TLAMs as part of the Gulf War air campaign. The Navy’s original TLAM target list had many targets suitable for both aircraft and TLAM strikes. The strategic air campaign planners’ capability-based perspective, and the JFACC’s unified targeting of both aircraft and TLAMs made it possible to avoid duplication, and maintain focus on the air plan objectives by using the two types of systems synergistically. TLAM attacks on soft targets were used to keep pressure on Baghdad during the day, while the F-117s with GBU-27s were employed at night against hard targets requiring penetration. In a similar vein, the first combat use of the Army Tactical Missile System (ATACMS) was initiated by air campaign planners applying an integrated approach to the use of force. Country of origin, service component, special operations force, missile, aircraft, or helicopter—did not matter—desired effect and system capability were the drivers of weapon selection for the air campaign—true jointness in action.

Optimum parallel war is dependent upon a functional organization encompassing not just the air component, but the entire theater campaign (i.e., a joint force land component commander, a joint force naval component commander, as well

as a joint force air component commander) with a true joint force commander (not dual-hatted as a component commander as well) orchestrating the synergies of the entire force.

Conclusion

In the Gulf War of 1991, aerospace power—from all the services—proved its potential as a definitive military instrument. Aerospace power did not act in isolation, however. It worked in conjunction with support from surface forces. Sea forces conducted a maritime interdiction campaign throughout the application of aerospace power. Ground forces helped to protect Saudi Arabia and reoccupied Kuwait after the air campaign had paralyzed enemy systems allowing Coalition ground forces to operate with minimal casualties. Retired Marine Corps Lieutenant General Bernard Trainor and New York Times correspondent Michael Gordon concluded in *The Generals’ War*, “It was also the first war in history in which airpower, not ground forces, played the dominant role.”

Nearly a decade later, aerospace power assumed the predominant role in Operation Allied Force. Combining global attack and parallel, precision engagements, aerospace forces demonstrated a step in the maturation of new concepts of warfare—once they were allowed to be employed. Because of political and military challenges and limitations, Allied Force was by no means a pure example of parallel warfare. Nonetheless, the air war over Serbia evidenced the potential of advanced technologies with effects-based warfare. Slobodan Milosevic’s ultimate capitulation supports the assertion of NATO spokesman Jamie Shea that “we [the coalition] are able to turn off and on the light switch in Belgrade, and hopefully also thereby to turn the

The tenets of effects-based operations can be applied in every medium of warfare.

lights on...in the heads and minds of the Belgrade leadership as they realize that they have no option but to meet the essential demands of the international community.”⁵⁹ Though we cannot know the exact calculus that forced Milosevic to concede, the basic math was undeniably taught through aerospace application of force to achieve specific effects other than the destruction of his forces—perhaps the “latent potentiality” Liddell Hart envisioned.

While the tenets of effects-based operations can be applied in every medium of warfare, the relative advantages of aerospace power—speed, range, flexibility, precision, perspective, and lethality—fit seamlessly in this strategic construct. Joint aerospace power has the potential to achieve effects at every level of war directly and quickly. As a result, it will remain the dominant means for conducting parallel war through effects-based operations in major regional conflicts in the future. However, more important than the characteristics of aerospace power is the strategic perspective associated with its most effective use—a perspective that views the theater or globe as well as the aerospace medium as an indivisible whole where weapons and information warfare actions are selected based on their ability to influence.

Effects-based operations have the potential to reduce the force requirements, casualties, duration of conflict, forward basing, and deployment of forces previously required to prevail in war. In short, the parallel approach changes the basic character of war. The Desert Storm air campaign gave us a glimpse of its potential, and the air war over Serbia at least incrementally improved the vision, but these were only the beginning. Aerospace power systems are rapidly evolving beyond manned aircraft, but the philosophy behind the use of those systems will remain. It is an evolution of the philosophy born with the airplane—the antithesis of attrition and annihilation warfare. It is the philosophy of control over an adversary’s strategic activity and the commensurate disruption of his decision-making process by direct influence and effect on the adversary’s ability to act. It is strategic vision, rather than flying

The parallel approach is a springboard for better linking military, economic, and political elements to conduct national security strategy in depth.

skills or rapid surface engagements, that will add value to the ongoing transformation of war. It is the fundamental recognition that legacy concepts, while instructive, may impair the development of transcendent ideas for military and national strategy. For in reality, the parallel approach is a springboard for better linking military, economic, and political elements to conduct national security strategy in depth. At some point—hopefully sooner rather than later—we must revisit our entire national security architecture with the goal of better integrating the departments that have grown into separate and distinct “empires.”

Some in the Russian military, studying very closely the conduct of the Gulf War, recognize the potential of new military technologies and strategies for the orchestration of war. Identifying Desert Storm as one of the “rare ‘turning points’ in military affairs fixing the evolution of warfare” at the “juncture of two epochs in military art,” they see the end of multi-million-man armies and the emergence of “aerospace war” as the determinant of military actions. Acknowledging that strategic objectives can be achieved through direct use of “aerospace strikes,” they have gone so far as to postulate that, “victory can be achieved without the seizure and occupation of territory by ground forces.”⁶⁰

The viability of the Russian claim gained credence given the outcome of the air war over Serbia. However, more relevant is the potential danger that exists if our own military institutions become blind to the possibility of change in the nature of war.⁶¹ Seeing new technologies and

“transformation” only as a means to modernize a preferred way to conduct war, rather than a means to exploit change in the nature of war, may prove disastrous. Potential antagonists recognize the significance in the “revolution in military affairs” now underway—it would behoove us to do the same.

At the beginning of the 21st Century, we must address how to close the strategy-resource gap created by demand for military forces that exceeds supply due to the post Cold War drawdown. Conventional wisdom suggests that there is one of two solutions: one, we either change the strategy to decrease demand, or two, we increase the military resources necessary to supply the strategy.

Potential antagonists recognize the significance in the “revolution in military affairs” now underway—it would behoove us to do the same.

However, there is another option—change our concepts of operation to capitalize on the modern capability resident in our aerospace and information power.

The goal of war is to compel an adversary to act according to our strategic interests. Ultimately our goal should be to be able to do so without that adversary even knowing they have been acted upon. If one thinks about the conduct of warfare from this perspective, then desired effects should determine engagement methods, and force application becomes only one of a spectrum of options. Focusing on effects—the end of strategy, rather than the traditional military means to achieve them through force-on-force—enables us to consider different and perhaps more effective ways to accomplish the same goal with fewer resources.

The challenge for a military steeped in the traditions, paradigms, and strategies of the past is recognizing the change, embracing it, and capitalizing on it before someone else does. Machiavelli said: “There is nothing more difficult to carry out, nor more doubtful of success, nor more dangerous to handle, than to initiate a new order of things.” He might also have added that there is nothing more worthwhile.

Notes

1. Major Greg Biscone, Langley AFB, VA, transcript of interview with author, October 11, 1993 and Colonel Terry A. Burke, Commander, 4300 Provisional Bombardment Wing, narrative from the recommendation of the Distinguished Flying Cross to the crews of Ghost Cell.
2. Eliot A. Cohen, et al., *Gulf War Air Power Survey, vol. 5, A Statistical Compendium and Chronology* (hereafter cited as GWAPS), (Washington, D.C.: US Government Printing Office, 1993), p. 253.
3. (S) "Master Attack Plan, 10 Jan 1991 with changes 1, 2, 3," printed 16 Jan 1991 at 2121h Riyadh time (Hereafter referred to as "Master Attack Plan: First 24 Hours," 2121, 16 January 1991). The Master attack plan was a new planning document developed by the author specifically to facilitate planning the Gulf War air campaign. A script at the operational level of war providing direction for the construction of the air tasking order (ATO), it specified targets, the timing of attacks, the aircraft force packages for each attack, and in some cases the specific weapons for the strike aircraft. Information extracted is unclassified.
4. Roger A. Freeman, *Mighty Eighth War Diary* (London: Jane's Publishing Co., 1981), pp 9-161. Between August 17, 1942—the 8th AF first heavy bomber raid—and December 31, 1943, the 8th AF flew 171 attacks. Subtracting leaflet missions, and accounting for multiple targets hit on one mission, result in attacks flown against 124 distinct targets. This number includes all 8th AF missions flown in the European theater of operations, not just those flown against Germany.
5. From a review of summary reports from World War I, World War II, the Korean War, Vietnam, and the Arab-Israeli wars of 1967 and 1973.
6. The term was coined by the Air Force Directorate of Warfighting Concepts Development (AF/XOXW). It first came into use immediately after the Gulf War.
7. The five systems mentioned here were used to model Iraq in the early design of the Gulf War air campaign. See John A. Warden III, "Employing Air Power in the Twenty-first Century," and in Richard H. Shultz, Jr. and Robert L. Pfaltzgraff, Jr., eds, *The Future of Air Power in the Aftermath of the Gulf War* (Maxwell AFB, AL: Air University Press, 1992), pp. 64-82.
8. (S) "Master Attack Plan: First 24 Hours," 2121, 16 January 1991. Information extracted is unclassified.
9. "It was an easy step for Clausewitz's less profound disciples to confuse the means [of war] with the end, and to reach the conclusion that in war every other consideration should be subordinated to the aim of fighting a decisive battle." B.H. Liddell Hart, *Strategy* (New York: Meridian, 1991), p. 319. While Liddell Hart is generally attributed by scholars as being unfair in his interpretation of Clausewitz, this quote captures today what many "modern" officers take away from *On War*.
10. For a clear and concise description of the enigma of Clausewitz's writings see Richard E. Simkin, *Race to the Swift—Thoughts on Twenty-First Century Warfare* (London: Brassey Defense Publishers, 1985), pp 8-14.
11. The construct of thinking about an opponent as a system is conducive to framing a strategic perspective about how to best change an opponent's behavior. My thanks to Colonel (ret) Phil Lacombe for the information on the origin of the term "system of systems."
12. For further elaboration of these particular systems and their use as a strategic model for an adversary, see John A. Warden III, "The Enemy as a System," *Airpower Journal*, Spring 1995, pp.41-50.
13. Lee B. Kennett, *A History of Strategic Bombing* (New York: Charles Scribner's Sons, 1982), p. 43, and *The First Air War, 1914-1918* (New York: The Free Press, 1991), p. 44.
14. Haywood S. Hansell, *The Strategic Air War against Germany and Japan* (Washington, D.C.: US Government Printing Office, 1986), p. 10.
15. Hansell, 12.
16. *The United States Strategic Bombing Survey Report* (European War) 1945, reprinted in *The United States Strategic Bombing Surveys* (European War) (Pacific War) (Maxwell AFB, AL: Air University Press, 1987), p. 13.
17. *The United States Strategic Bombing Surveys* (European War) (Pacific War), p. 18.
18. Richard G. Davis, *Carl A. Spaatz and the Air War in Europe* (Washington, D.C.: Center for Air Force History, 1983), p. 283.
19. The first such allied guided bomb, the Azon bomb (VB-1), achieved excellent results against bridges in Burma during late 1944 and 1945. Wesley, F. Craven and James, L. Cate, eds., *The Army Air Forces In World War II, vol. 6, Men and Planes* (Chicago: University of Chicago Press, 1955; new imprint, Washington, D.C.: Office of Air Force History, 1983), p. 259.
20. Over 4000 LGBs were dropped between April 1972 and January 1973. Thomas A. Keaney and Eliot A. Cohen, *Gulf War Air Power Survey, Summary Report* (Washington, D.C.: US Government Printing Office, 1993), p 226.
21. Ibid, p.226.
22. To have a 90 percent probability of one (1) bomb hitting a 60 x 100 foot target (size of a small bunker), would take 9070 bombs with B-17 accuracy (3300 foot CEP) compared with the accuracy of one (1) bomb (10 foot CEP) dropped from aircraft equipped to drop LGBs (F-117, F-111, F-15E, A-6, RAF Tornados, and Buccaneers). Briefing chart, AF/XOXW, Fall 1990.
23. Actual figure for all US munitions expended: 6728 PGM, 16,587 non-PGM/other. Significantly, 64% of the Desired Mean Points of Impact (DMPI) were struck with PGM, yet 71% of the munitions were non-PGM/other. "Air War Over Serbia (AWOS) Fact Sheet," 31 Jan 00, p. 6.
24. Karl J. Eschmann, *Linebacker, The Untold Story of the Air Raids Over North Vietnam* (New York: Ivy Books, 1989), p. 32.
25. Richard P. Hallion, *Storm Over Iraq, Airpower and the Gulf War* (Washington, D.C.: Smithsonian Institution Press, 1992), pp. 293-294.
26. (S) Secretary of the Air Force Staff Group (SAF/OSX) Memorandum For Secretary Rice [by author], 9 October 1990, p. 4 (emphasis in the original). Information extracted is unclassified.

27. "F-117 Target Analysis," 19 April 1991, by author. Of 688 targets on the MTL (corrected for duplication), 298 were attacked by F-117s. Data from (S) "Master Target List," 1 March 1991, Central Command Air Force (CENTAF) Iraq Target Planning Cell and 37th Tactical Fighter Wing Mission Electronic Database, March 1991. The F-117 flew 1299 of 74,091 combat sorties (1.75 percent) between 16 Jan 91 and 28 Feb 91. The definition of combat sorties used here includes only coalition fighter or bomber aircraft, not tankers, airlift, or other types of support. Data from (S) GWAPS, pp. 334-335. Information extracted in unclassified.
28. (S) "Master Attack Plan: First 24 Hours," 2121, 16 January 1991." Information extracted is unclassified.
29. Some practitioners of annihilation strategy include Alexander, Caesar, and Napoleon. Examples of attrition warfare are Washington's strategy during the Revolutionary War, Grant's campaign in Virginia, and German General Von Falkenhayn's strategy of exhaustion in the trenches of World War I. For more on this subject see Gordon A. Craig, "Delbruck: The Military Historian," in *Makers of Modern Strategy, from Machiavelli to the Nuclear Age*, ed. Peter Paret (Princeton, N.J.: Princeton University Press, 1986), pp. 341-345.
30. Sun Tzu, *The Art Of War*, trans. by Samuel B. Griffith (New York: Oxford University Press, 1971), p. 79.
31. Basil H. Liddell Hart, *Strategy*, (New York: Meridian, Penguin Books, 1991 [Second revised edition], p. 325, (emphasis added). Though Liddell Hart was not directly referring to the above Sun Tzu words, he offers a similar notion on page 324: "The perfection of strategy would be, therefore, to produce a decision without any serious fighting. History, as we have seen, provides examples where strategy, helped by favorable conditions, has virtually produced such a result."
32. "The TACC Targeting Process," in Target Intelligence Standard Operating Procedures, used by targeteers of the CENTAF Intelligence organization in 1990/1991.
33. Air Force Pamphlet 200-17, *An Introduction to Air Force Targeting*, 23 June 1989, p. 21.
34. (S) CCJ-2-T Fact Paper, "Subject: Electric Power Facilities Analysis D+29," 15 Feb 1991. Information extracted is unclassified.
35. In the absence of theater-based intelligence concerning effects of attack upon target systems in addition to the outcome of attacks on individual targets, planners obtained this information daily by secure FAX directly from a variety of agencies in Washington, D.C. These "strategic assessments" were valuable in determining when, and how much, to change focus in constructing the daily master attack plans.
36. August 7, 1990 to August 17, 1990—the development period of an air option for the use of force in the Gulf crisis. The title of the briefing for the Commander-in-Chief, US Central Command (CINCCENTCOM) on August 17, 1990 describing this air option was "Iraqi Air Campaign, Instant Thunder." The several hundred page operations plan accompanying the presentation was entitled, "Proposed Iraqi Air Campaign, Operation Instant Thunder, STRATEGIC AIR CAMPAIGN Against Iraq To Accomplish NCA Objectives."
37. In constructing the master attack plan each target set was viewed as a system with a specific operational level objective associated with it. Achieving the operational objective of each target set contributed to rendering a higher order parent strategic level center of gravity ineffective. "Fielded military forces" was the parent strategic level center of gravity of which the strategic air defense system was an operational element. The operational objectives for each target set were specified on the master target list sent to the CINC, CJCS and SECDEF in early January 1991.
38. (S) "Master Attack Plan, 6 Sep 90." Information extracted is unclassified.
39. "Target Attacks" are the number of lines associated with an aircraft or force package attacking a target in one of the 12 JFACC target categories on the first 24-hour master attack plan.
40. "Campaign flow, update as of 16 Aug [1990] 2000L," Instant Thunder briefing chart 21 and (S) "Master Attack Plan, 10 Jan 1991," Information extracted is unclassified.
41. "Once the TACC has received the LCC (land component commander)...nominations and...prioritized target list from the BCE (battlefield control element), the TACC plans the...sorties and support packages to meet the LCC forces required to achieve the requested effect on each target (emphasis added)." From the Joint Operational Interface of the Ground Attack Control Capability Study (Langley AFB, VA: 1986), explaining how ground attack control is envisioned to fit into the twenty-first century TACS, in Thomas H. Buchanan, *The Tactical Air Control System: Its Evolution and its Need For Battle Managers*, Research Report No. AU-ARI-87-1 (Maxwell AFB, AL: Air University Press, 1987).
42. For an insightful study and analysis of the Air Force command and control system for the conduct of conventional war, see J. Taylor Sink, *Rethinking the Air Operations Center, Air Force Command and Control in Conventional War*, School of Advanced Airpower Studies Thesis (Maxwell AFB, AL: Air University Press, June 1993).
43. TACM 2-1, *Aerospace Operational Doctrine: Tactical Air Operations*, 15 April 1978.
44. "On April 21, 1983, General Charles A. Gabriel, CSAF, and General E.C. Meyer, CSA, signed a memorandum of understanding on 'Joint USA/USAF Efforts for Enhancement of Joint Employment of the AirLand Battle Doctrine.' The two Services agreed to engage in joint training and exercises 'based on the AirLand battle doctrine as promulgated in Army FM 100-5, 'Operations,' 20 August 1982." Richard G. Davis, *The 31 Initiatives* (Washington, D.C.: Office of Air Force History, 1987), p. 35.
45. Air Force Pamphlet (AFP) 200-18, *Target Intelligence Handbook, Targeting Principles*, 1 October 1990.
46. "Tactical aviators have two primary jobs—to provide air defense for the North American continent and support the Army in achieving its battlefield objectives." General Robert D. Russ, USAF (Commander of TAC), "Open Letter to the Field," AirLand Bulletin 81-1 (Langley AFB, VA: TAC-TRADOC ALFA, 31 March 1988), p. 7.
47. See Reynolds, Richard, *Heart of the Storm: The Genesis of the Air Campaign Against Iraq* (Maxwell AFB, AL: Air University Press, January 1995), and Clancy, Tom and Horner, Chuck, *Every Man a Tiger* (New York, NY: G.P. Putnam's Sons, 1999) for expanded accounts of the early planning process.
48. In the JFACC's "Theater Air Campaign" progress briefing to Secretary of Defense Richard Cheney and Chairman of the Joint Chiefs of Staff General Colin Powell in Riyadh on 9 February 1991, one of the charts depicts that by the day before the briefing, 8 Feb 91, 23 days into the air campaign, only 11 were "effect flying days."

49. In this sense, it meets the definition for some as a military revolution. See Dan Goure, "Is There a Military-Technical Revolution in America's Future?" *The Washington Quarterly*, 16 (Autumn 1993), p. 179. For others the revolution is yet to occur. The closing sentence of the GWAPS summary report states, "the ingredients for a transformation of war may well have become visible in the Gulf War, but if a revolution is to occur someone will have to make it." Thomas A. Keaney and Eliot A. Cohen, *Gulf War Air Power Survey, Summary Report*, (Washington, D.C.: US Government Printing Office, 1993), p. 251.
50. In the first 24 hours of the Gulf War the enormous leverage of stealth, precision, and effects-based planning allowed targeting 42 stealth aircraft sorties armed with PGMs (along with three EF-111 sorties) against 60 percent as many targets as were attacked by all the non-stealth land-based fighter sorties, and against more targets than the complete air and missile force launched from the entire complement of six aircraft carriers and nine TLAM launching ships in the theater. (S) "Master Attack Plan: First 24 Hours," 2121, 16 January 1991," Information extracted is unclassified.
51. "Operation Desert Storm Target List and Master Attack Plan," RAND, March 1992, and "Master Attack Plan: First 24 Hours," 2121, 16 January 1991. Information extracted is unclassified. "Target Attacks" are the number of lines associated with an aircraft or force package attacking a target in one of the 12 JFACC target categories on the first 24-hour master attack plan. Height of sortie and target attack bars are in proportion to total sorties and total target attacks respectively. Of the 45 sorties listed as "stealth and precision," three are EF-111 sorties that were planned as part of the second group of F-117 attacks against Baghdad.
52. It takes 618 C-141 and 18 C-5 loads to move a light infantry division. To move the entire number of PGMs used in the Gulf War requires 450 C-141 loads. Military Traffic Management Command, Transportation Engineering Agency Deployment Planning Guide, Appendix C—Strategic Movement Requirements, 19 August 1991.
53. The original estimates of the IBCT were approximately 10,000 short tons and 3,400 troops. (TRADOC presentation, "Four-Star Conference: Initial BCT Charter Operational and Organizational Concept," 10-11 Jan 2000). This study recognized that in order to meet the targeted 96-hour deployment, the tonnage would have to be reduced to approximately 7,800 tons. Even at that figure, the airlift requirement exceeds the capability of the entire Air Force inventory (based on number of aircraft, expected reliability rates and requisite speed). On 23 Oct 2000, an Army General officer briefing indicated that the IBCT was currently experimenting with fewer vehicles and troops, though the tonnage remained approximately 8-9000 tons. Future divisions, with an objective 60-70 percent weight reduction from current divisions, face the similar reality of insufficient aircraft inventory. The replacement of C-141s with C-17s actually increases airlift's aggregate tonnage capacity--the simultaneous reduction of the number of "tails" forms the limiting factor.
54. Paul H. Nitze, "To B-2 or Not to B-2?" *The Washington Post*, July 17, 1994, C4.
55. Ibid, C4.
56. "It was a given that air power theory is enjoying a renaissance that is completely unrealistic in light of the reality of the Gulf War or of capabilities achievable in any reasonable timeframe." Attributed to Army Chief of Staff Gordon Sullivan in "Sullivan to Raise the Stakes on Roles & Missions," *Inside the Army*, vol. 6, no. 31, (August 1, 1994), p. 12. Russian military leadership takes the opposite view. General-Major I. N. Vorob'yev views the Gulf War as, "one of those rare 'turning points' in military affairs..." prompting, "a radical re-examination of the structure of armed forces and the roles of particular branches," and calls, "for a 'new military thinking' on the part of 'our generals and officers' who are still locked into the 'inertial thinking' of the World War II generation." Mary C. Fitzgerald, *The Impact of the Military-Technical Revolution On Russian Military Affairs: Volume I* (Washington, D.C.: Hudson Institute, 20 August 1993), pp.5-6.
57. Maj Gen Royal N. Moore, Jr., "Marine Air: There When Needed." *US Naval Institute Proceedings*, (November 1991), pp. 63-70. "This way I didn't have to play around with the [joint air planning] process while I was waiting to hit a target. I kind of gamed the ATO process." "The Navy's trouble was that they tried to do it honestly and write just what they were going to fly." Others in the Marine Corps who dealt with the JFACC planners on a daily basis had a different perspective, "To those that had day-to-day dealings with the Air Force it became readily obvious that the JFACC's primary concern was to coordinate the efforts of theater aviation, deconflict airspace, and increase efficiency of the air campaign." Col J.W. Roben, Marine Liaison, CENTAF, USMC, Operation Desert Shield/Desert Storm After Action Report, 18 March 1991.
58. President George W. Bush, "Address to the Air University," Maxwell AFB, Alabama, April 13, 1991.
59. Jamie Shea, NATO Spokesman, NATO news backgrounder, 4 May 1999; on-line, Internet, 22 Feb 2000, available from <http://www.eucom.mil/operations/af/nato/1999/may/99may04.htm>. Directly related to this citation is the fact that 2/10th of 1% of the targets struck were against electrical power, yet 85% of Serbia was without power. ("Air War Over Serbia (AWOS) Fact Sheet," 31 Jan 00, p. 5). Though it is certainly speculative as to whether this contributed to Milosevic's decision-making process, the effects such attack created cannot be ignored, and likely influenced his capitulation. In essence, the Kosovo campaign combined effects-based and parallel targeting to create the psychological realization of potential annihilation—with less risk, and less destruction.
60. Fitzgerald, pp. 1-6.
61. See, for example, Brig. General Robert J. Scales, Jr., et. al., *Certain Victory: The United States Army in the Gulf War* (Washington, D.C.: Office of the Chief of Staff, US Army, 1993), p. 388. "Desert Storm confirmed that the nature of war has not changed...the strategic core of joint warfare is ultimately decisive land combat."

About the Author

Brigadier General David A. Deptula, United States Air Force, has taken part in air operations, defense planning, and joint war-fighting from unit to unified command and service headquarters levels. He also served on two congressional commissions charged with outlining the Nation's future defense needs--the Commission on Roles and Missions of the Armed Forces, and the National Defense Panel.

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General Deptula returned to the Middle East as Commander, Joint/ Combined Task Force Operation Northern Watch during 1998-1999, where he led a coalition of Turkish, British and U.S. forces enforcing the no-fly zone over northern Iraq. In this position he flew 82 combat missions during a period of renewed Iraqi



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General Deptula is a command pilot with over 3,000 flying hours (over 400 in combat) in operational fighter and training assignments.



The author, then Lt Col Deptula, briefing General Norman Schwarzkopf on the air campaign just hours before Desert Storm began.



The author, Brig Gen Deptula, in the air over Iraq as Commander, Operation Northern Watch (1998-99)



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